TECHNICAL INFORMATION

XP1 400

FINE GRAIN, FAST BLACK AND WHITE FILM
WITH ASSOCIATED XP1 CHEMISTRY

ILFORD

1 A new technology black and white material

ILFORD XP1 400 black and white film is an entirely new type of photographic material that establishes new standards of quality and introduces new possibilities in both picture taking and print making.

The exceptional performance characteristics of XP1 400 arise from a major innovative advance in the monochrome emulsion manufacturing technique: the inclusion of colour-dye technology into black and white film making. This is supported by innovative advances in processing chemistry, resulting in XP1 processing chemicals.

XP1 400 emulsion is coated on 0.13mm (5/1000 inch) acetate base, is spooled in standard 35mm film cassettes and should be loaded in subdued light in the same way as other 35mm films.

1.1 High speed together with very fine grain

While XP1 400 is designed to have a speed of 400ASA 27DIN 400/27°ISO (see back page), it also has the exceptionally fine grain associated with a slower, general purpose film. This remarkable property removes the need for photographers to have to compromise grain for speed: XP1 400 permits the highest quality pictures to be taken even when the requirement is for high film speed.

1.2 Outstanding quality enlargements

The extremely fine grain of XP1 400 enables, for the first time, high quality enlargements to be made of subjects that require the use of a fast film.

1.3 Excellent exposure latitude

XP1 400 is extremely tolerant to over exposure. Negatives over exposed by as much as three stops but processed for the standard recommended time have even finer grain than normally exposed negatives, although they will naturally appear denser and require longer print exposure times.

XP1 400 film may also be under exposed by about one stop without changing development. A small increase in grain size will be seen on prints made from such negatives.

Thus, in those applications where light levels are constantly changing, or where a diverse range of subject matter has to be photographed in a short time, XP1 400 film offers the security of excellent exposure latitude – together with improved quality when over exposed.

1.4 Push processing capability
XP1 400 also has the potential for very high film speed and may be push-processed to achieve effective meter settings of 800–1600ASA 30–33DIN. Compared with other push-processed films, the results are extremely good. XP1 400 retains edge sharpness and offers finer grain together with better tonal rendition in the shadows.

1.5 Single negative contrast for all enlarger types
One other benefit that will be appreciated in the darkroom is that the special, non-silver image of XP1 400 removes the need to adjust development time to suit the contrast requirements of most enlarger systems. In the majority of cases the negative may be printed on the same grade of paper regardless of enlarger type. With certain enlargers (eg cold cathode), a change of grade may be required.

1.6 Special processing chemicals
XP1 processing chemicals have been designed in conjunction with XP1 400 film. These chemicals comprise a developer and a bleach fix. They are easy to prepare and are intended for one-shot processing. XP1 chemicals are recommended for processing at 38°C but may be used over the range 30–40°C.

1.7 C41. Processing.
XP1 400 is fully compatible with C41 chemistry. See Section 4.1.

2 Exposure details

XP1 400 is a fast black and white panchromatic film designed to give high quality results over an extremely wide range of lighting conditions.

2.1 Exposure rating
XP1 400 should be rated at 400ASA 27DIN 400/27°ISO for all normal work. When even higher speed is required it may be rated at 800–1600ASA 30–33DIN and given extended development (see 4.10).

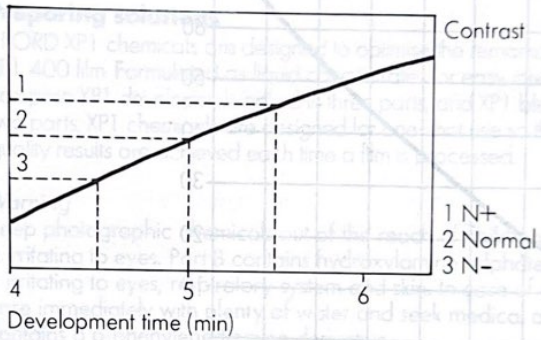
In special circumstances where even finer grain is required XP1 400 can be rated at 200ASA and given normal development.

2.2 Exposure/development technique
While the recommended development time for XP1 400 is suitable for most types of photography, it is sometimes necessary to adjust processing to suit the subject brightness range of the scene being photographed. For example, in very bright sunlight it could be beneficial to increase exposure by say ½ stop and reduce development.

This would slightly compress the negative density range. Conversely, when the subject brightness range is low, it is desirable to increase development. No change in exposure is usually necessary. The contrast-time graph below offers some guidance in selecting the modified development required.

The time indicated by '–' may be used where the subject brightness range is large. Conversely, the longer times indicated by the '+' line may be used where the subject brightness is small.

Contrast time curve



2.3 Filter factors

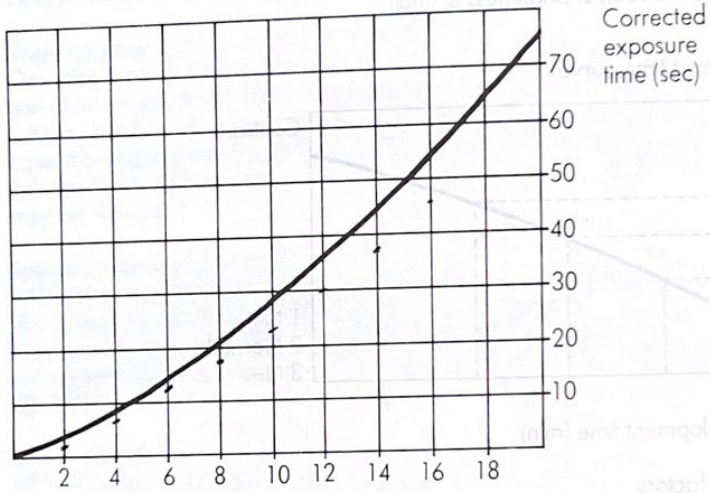
XP1 400 may be used with all kinds of filters (eg colour, polarizing and neutral density filters) in the usual way.

The factors quoted below give a practical guide to the increase in exposure necessary when using the filter listed. The factors for tungsten light are based on an average tungsten light source which has a colour temperature of 2850K.

	Daylight	Tungsten
Yellow (ILFORD 104)	1.5	1.5
Yellow-green (ILFORD 402)	2.5	4
Orange (ILFORD 201)	3	3
Red (ILFORD 204)	6	4
Neutral density (0.3)	2	2

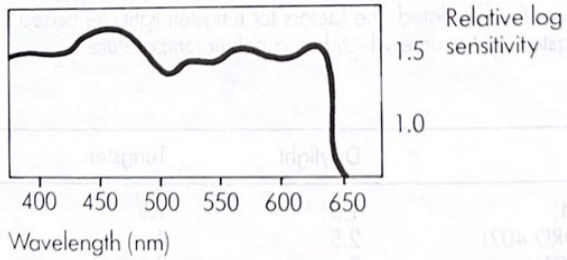
2.4 Reciprocity characteristics

XP1 400 film need not be corrected for reciprocity law failure when exposures between ½ and 1/1,000,000 second are given. Exposure times longer then ½ second must be extended to allow for reciprocity law failure: use the graph below to calculate the increased exposure time which should be given once the measured time is known. For extremely short exposure times it may be necessary to use a larger lens aperture than that indicated.

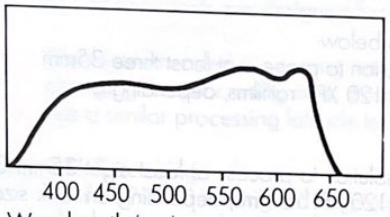


2.5 Spectral sensitivity

Equal energy curve



Wedge spectrogram to tungsten light 2850K



3 Preparing solutions

ILFORD XP1 chemicals are designed to optimise the remarkable properties of XP1 400 film. Formulated as liquid concentrates for easy mixing and use, they comprise XP1 developer, supplied in three parts, and XP1 bleach fix, supplied in two parts. XP1 chemicals are designed for one-shot use so that the same high quality results are achieved each time a film is processed.

Warning

Keep photographic chemicals out of the reach of children. Developer part B is irritating to eyes. Part B contains hydroxylamine sulphate. Developer part C is irritating to eyes, respiratory system and skin. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Part C contains a p-phenylenediamine derivative.

Avoid spilling liquid concentrates and protect working surfaces. Developer part C in particular, will stain when it dries. To avoid cross contamination of chemicals, ensure that all mixing vessels and measuring cylinders are clean. Avoid using chipped enamel or low grade stainless steel mixing vessels.

XP1 developer may be prepared as a stock solution which is diluted to working strength before use.

XP1 bleach fix working strength solution should be prepared immediately prior to use.

Dispose of used XP1 400 chemistry with plenty of water. Ensure that all components of processing tanks used for XP1 400 processing are thoroughly rinsed with running water before processing further films.

3.1 XP1 400 1 litre and 2.5 litre Chemistry Kits:

XP1 Chemistry kits should be mixed as below:
The 1 litre kit will make up enough solution to process at least three 35mm 36 exposure XP1 films or at least two 120 XP1 rollfilms, depending on tank size.

The 2.5 litre kit will make up enough solution to process at least eight 35mm 36 exposure XP1 films or at least five 120 XP1 rollfilms, depending on tank size.

3.2 To prepare developer stock solution (bottles with RED labels)

1 Pour the contents of bottles A and B into a mixing vessel and stir.
2 Add the contents of bottle C. Stir thoroughly.
3 Rinse out the component bottles and refill with stock solution.
4 Affix a 'stock solution' label on each bottle to confirm that stock solution has been prepared.

4 Processing

XP1 kit chemicals are designed for one shot processing of XP1 400 film.

The recommended processing temperature for XP1 400 is 38°C, although by changing the processing time, it may be varied between 30-40°C. XP1 400 has a similar processing latitude to other black and white films.

4.1 C41 Processing

Whilst XP1 400 is designed to give optimum results in its own chemistry it may also be processed in C41 chemistry. Films rated at 400 ASA should be processed for the standard C41 processing time of 3'15" @ 38°C. Extended processing times must be given for films rated at 800 ASA and 1600 ASA. These are 4'15" and 5' respectively.

When XP1 400 film is processed in C41 Chemistry there is some slight loss of sharpness, due mainly to continuous agitation and the loss of edge effects.

4.2 Processing in Continuous Drum Processor e.g. Jobo

XP1 400 film may be processed in continuous drum processors. Correct processing times can best be found by experimentation with individual equipment. However, as a guide, we suggest that, at 20 revolutions per minute, a development time of 4' @ 38°C is given.

4.3 XP1 Replenishable Chemicals

These chemicals have been designed for deep tank and machine processing and give similar quality to the one shot chemistry.

4.4 Safelight recommendations

XP1 400 film should be handled in total darkness.

4.5 Use of a water bath

A water bath to maintain processing temperature is strongly recommended and should be prepared about 2°C above the desired processing temperature. The water bath may consist simply of a container into which a large volume of water may be poured (eg processing dish, bucket). It need not be thermostatically controlled.

To bring the loaded processing tank up to temperature before processing, stand it in the water bath while mixing up working strength solutions. The vessel in which working strength bleach fix solution is contained should also be stood in the water bath during development.

4.6 Mixing working strength solutions:

To avoid a drop in temperature during processing, working strength solutions should be made up at about 2°C higher than the processing temperature. To make up working strength solutions at 40°C, add water at 50-55°C and bring to temperature in the water bath.

To prepare working strength developer:

XP1 developer should be diluted 1+3 with water. Table 1 shows the volume of stock solution and water required for a range of processing tank sizes.

Table 1

Tank volume (ml)	240	300	350	400	450
Developer stock solution	60	75	88	100	113
Water	180	225	262	300	337

To prepare working strength bleach fix:

Table 2 shows the volumes of concentrates and water required for a range of processing tank sizes. To mix working strength bleach fix add the specified volumes of bottles A and B to the specified volume of water with stirring.

Table 2

Tank volume (ml)	240	300	350	400	450
Volume of Bleach fix Part A	48	60	70	80	90
Volume of Bleach fix Part B	48	60	70	80	90
Volume of Water	144	180	210	240	270

4.7 Standard processing

Table 3 gives standard processing recommendations at 38°C. Times at other temperatures may be obtained from the chart below (see 4.8). Agitation should be by inversion during the first 10 seconds and for 10 seconds (ie 4 inversions) every minute for both development and bleach fixing.

While washing XP1 400 film at the same temperature used for developer and bleach fix is recommended, it is not essential. Washing may be done at a lower temperature, but not below 5°C, provided the change in temperature is made gradually to avoid reticulation. Extended washing times are given below:

5' @ 30°C
10' @ 20°C
20' @ 10°C
30' @ 5°C

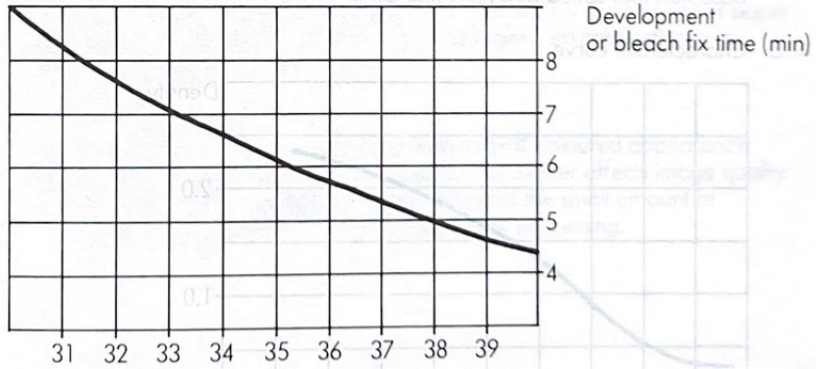
Table 3

	Temperature	Time	Comments
Water bath	40°C	—	Prepare 2°C above processing temperature
Develop	38°C	5 min	Mix at 40°C
Bleach fix	38°C	5 min	
Wash	35–40°C	3 min	Temperature may be lowered slowly
Final rinse	—	—	In ILFORD ILFOTOL wetting agent (diluted 1+400)
Drying	up to 55°C	—	Wipe with a squeegee or chamois cloth. Dry in a dust-free atmosphere

Note: XP1 400 film has a milky background appearance when wet. This disappears on drying and should not be associated with insufficient fixation.

4.8 Time temperature chart

Development and bleach-fix times are equal throughout the recommended time/temperature range.



4.9 Push processing

While standard development is recommended for the majority of photographic work, regardless of the exposure given, there are occasions when XP1 400 will benefit from extended development. An extended development time of 7½ minutes at 38°C (100°F) is recommended when XP1 400 has been given the minimum exposure in poor lighting or low lighting conditions.

The recommended development times for XP1 400 film at 800ASA 30DIN and 1600ASA 33DIN are given in table 3. It is not necessary to increase the bleach-fix time when push-processing.

Table 4

Meter setting ASA	DIN	ISO	Development Min/38°C
800	30	800/30°	6½
1600	33	1600/33°	7½

It should be noted that the exposure meter settings recommended for push-processing are based on practical evaluation of film speed and are not based on foot speed as is ASA and DIN.

4.10 Characteristic curve

The above curve was plotted from readings obtained using a tricolour blue filter.

5 Print making

XP1 400 negatives are designed to be printed in the normal manner, and like other black and white negatives, are compatible with graded – both fibre base (ILFORD ILFOBROM and ILFOBROM GALERIE) and polyethylene-coated (ILFORD ILFOSPEED) – and variable contrast (ILFORD ILFOSPEED MULTIGRADE) papers.

5.1 Negative density

Correctly processed XP1 400 negatives appear slightly darker than other black and white negatives.

5.2 Emulsion side identification

Unlike most black and white negatives, the emulsion side of XP1 400 film has a glossy surface. To ensure that negatives are positioned emulsion side down in the enlarger, check that the frame numbers are projected onto the baseboard the right way round (ie not laterally reversed).

5.3 Film contrast

XP1 400 negatives have a dye image. Unlike the conventional black and white negative image which is made up of silver, the contrast of such an image is virtually unaffected by the system of enlarger illumination used. In most cases XP1 400 negatives may be printed on the same grade of paper regardless of enlarger type. With certain enlargers, eg cold cathode, a a change of grade may be required.

5.4 Negative appearance

Processed XP1 400 negatives will lose their overall coloured appearance when exposed for long periods to daylight. This neither affects image quality nor printing time. It is caused by the bleaching of the small amount of sensitising dye that remains in the emulsion after processing.

6 Storage

Store chemicals at 5–20°C. See table 5 for details of useful life.

Table 5

Form	Condition	Useful life
Developer Concentrate	In full bottles	1 year
Developer Stock solution	In full bottles	3 months
	In half-full bottles	6-8 weeks
Bleach Concentrate	In full bottles	1 year
	In half-full bottles	10 months

Store unexposed film in the same way as colour film, ie in a cool, dry place in the original packaging and away from colour negative processing chemicals and other chemicals containing formaldehyde. Certain materials, which exude small quantities of formaldehyde should also be avoided, such as new and simulated leather and foam. Thus when using new camera bags and holdalls made of such material, always retain film in its original packaging and process it as soon after exposure as possible. When film processing cannot be done within a few days of exposure, transfer exposed film to a more suitable storage container.

If correctly stored unexposed XP1 400 film will remain in good condition for at least 2 years. Processed negatives should be stored in a cool, dry place in the dark. In common with other materials with a dye image, films may fade if incorrectly stored.

Names printed in capitals are ILFORD trade marks.

ISO (International Standards Organisation) standards have been set up to establish internationally recognised units relating to the measurement of a wide range of parameters. The standard relating to film speed is made up of two parts – the first, an arithmetic value (equivalent to ASA); the second, a logarithmic value (equivalent to DIN).

ILFORD U.K. SALES COMPANY
14-22 TOTTENHAM STREET
LONDON W1P 0AH
TEL. 01-636 7890